



CE8 Subtest 1: Results of intra deblocking filter testing by SKKU/SKT

JCTVC-D334

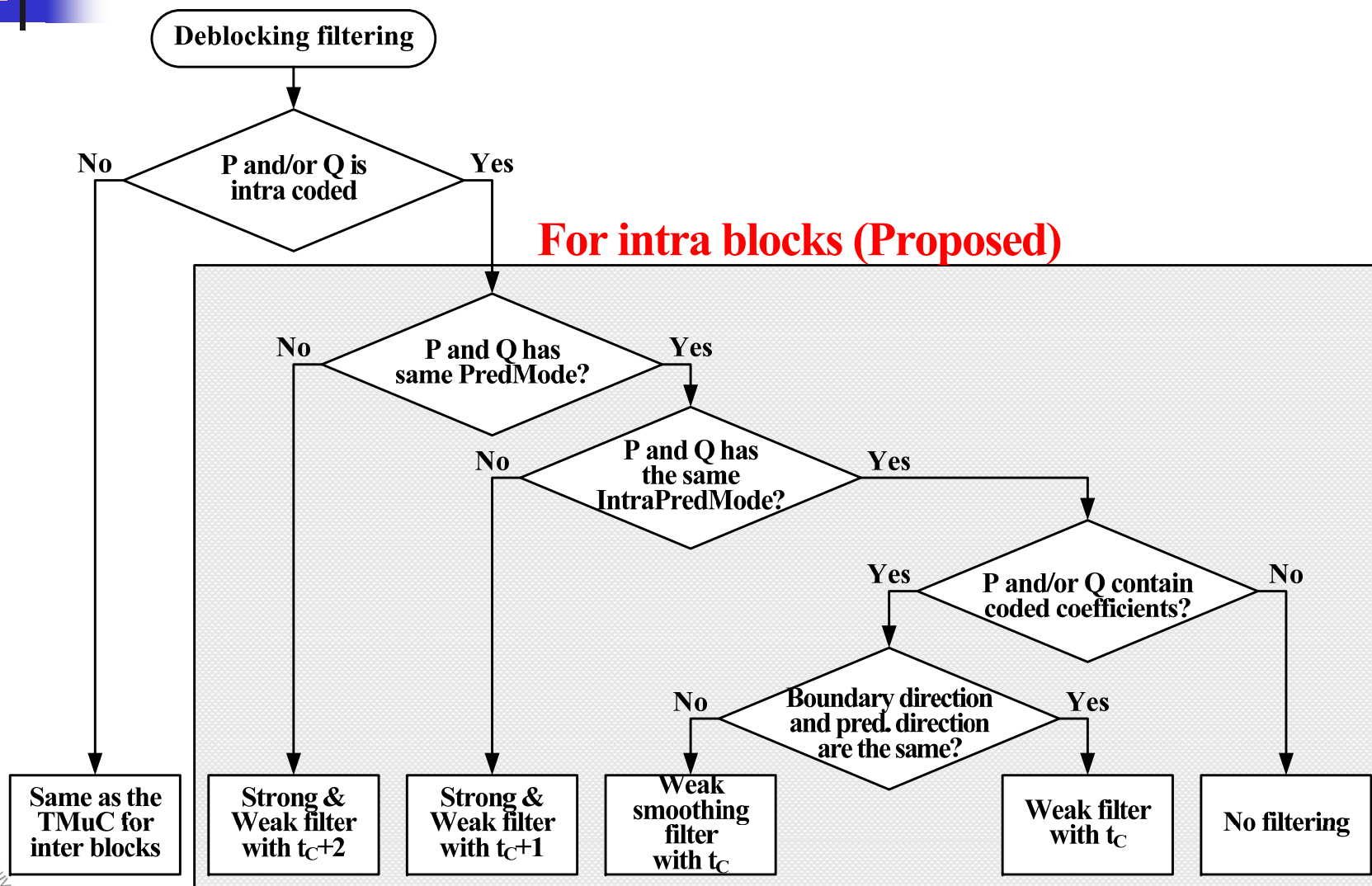
proposal by

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Introduction

- A *computationally very simple deblocking filter designed with special attention to intra blocks.* (n JCTVC-B075 & JCTVC-C130)
 - *Intra prediction mode and its relationship with block boundary are taken into account* in filter strength decision for deblocking intra-coded blocks
 - No other parts are modified in HM1.0
- *Basic frame exactly same as HM1.0 ~ only very small changes in code*
 - Even small change of assigning different filter strength of filtering for intra-coded blocks have generated positive coding gain at no computational impact
- In this proposal, the performance of the proposed method is evaluated under the CE8 Subtest1 procedures.
 - This result is cross-verified by NEC(JCTVC-D206)

Proposed Method



Proposed Method

■ Deblocking filter of TMuC for intra block

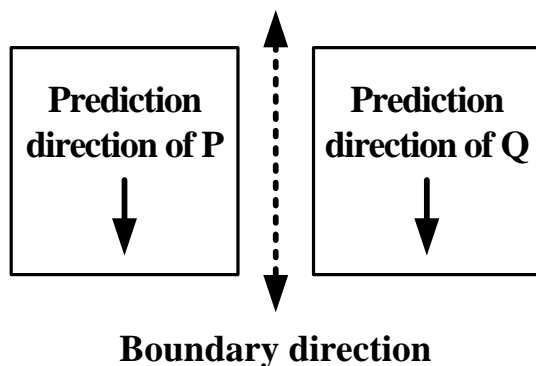
P and/or Q are intra coded	Strong and weak filtering with t_c+4
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■ Deblocking filter of the proposed method for intra block

P and Q are intra coded and P and Q have the same IntraPredMode and P and Q have no non-zero transform coefficients	No filtering
P and/or Q are intra coded and P and Q have different PredMode	Strong and weak filtering with t_c+2
P and Q are intra coded and P and Q have different IntraPredMode	Strong and weak filtering with t_c+1
P and Q are intra coded and P and Q have the same IntraPredMode and boundary direction & prediction direction are different	Weak smoothing filtering with t_c
Otherwise	Weak filtering with t_c

Proposed Method

- Equality check of direction of intraPredMode and block boundary



< Same direction case >

$$\Delta = \text{Clip}(-t_c, t_c, (13(q0_i - p0_i) + 4(q1_i - p1_i) - 5(q2_i - p2_i) + 16) >> 5))$$

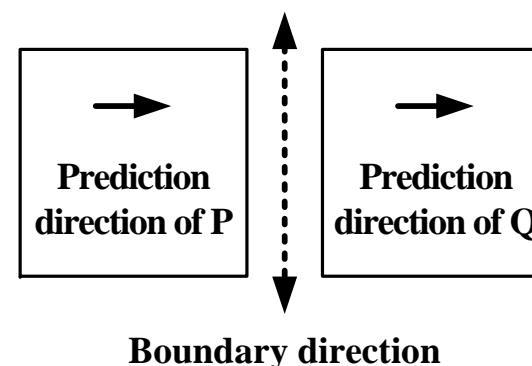
$$p0_i = \text{Clip}_{0-255}(p0_i + \Delta)$$

$$q0_i = \text{Clip}_{0-255}(q0_i - \Delta)$$

$$p1_i = \text{Clip}_{0-255}(p1_i + \Delta/2)$$

$$q1_i = \text{Clip}_{0-255}(q1_i - \Delta/2)$$

Weak filtering



< Different direction case >

$$\Delta = \text{Clip}(-t_c, t_c, (4(q0_i - p0_i) + (q1_i - p1_i) + 4) >> 3))$$

$$p0_i = \text{Clip}_{0-255}(p0_i + \Delta)$$

$$q0_i = \text{Clip}_{0-255}(q0_i - \Delta)$$







$$p1_i = \text{Clip}_{0-255}(p1_i + \Delta/2)$$

$$q1_i = \text{Clip}_{0-255}(q1_i - \Delta/2)$$

Weak smoothing filtering

Proposed Method

- Equality check of IntraPredModes of P and Q

Prediction direction of P	Prediction direction of Q	Prediction direction of P	Prediction direction of Q	Prediction direction of P	Prediction direction of Q
 0	 -1	 0	 0	 0	 +1

If ($|IntraPredAngleID \text{ of } P - IntraPredAngleID \text{ of } Q| < 2$) same direction;
else different direction

- Exception: when P and Q are of **both** DC Prediction Mode

Prediction direction of P	Prediction direction of Q
DC	DC

weak smoothing filter is applied (i.e., the equality check of boundary direction and pred. direction” is skipped)

Simulation Results

- Under the recommended test conditions of CE8 Subset1

	HE			LC			HE w/o ALF		
	IO	RA	LD	IO	RA	LD	IO	RA	LD
Class A	-0.9	-0.5		-0.5	-0.3		-0.5	-0.3	
Class B	-0.6	-0.3	-0.1	-0.5	-0.3	0.0	-0.4	-0.2	0.0
Class C	-0.5	-0.3	-0.1	-0.5	-0.2	0.0	-0.5	-0.2	-0.1
Class D	-0.5	-0.2	-0.1	-0.4	-0.2	-0.1	-0.4	-0.1	0.0
Class E	-0.6		-0.2	-0.3		-0.1	-0.3		-0.1
All	-0.6	-0.3	-0.1	-0.4	-0.3	-0.1	-0.4	-0.2	-0.1
Enc. Time	102	99	101	104	100	100	100	100	101
Dec. Time	101	100	100	102	102	100	101	100	100

Visual Quality Comparison (1)

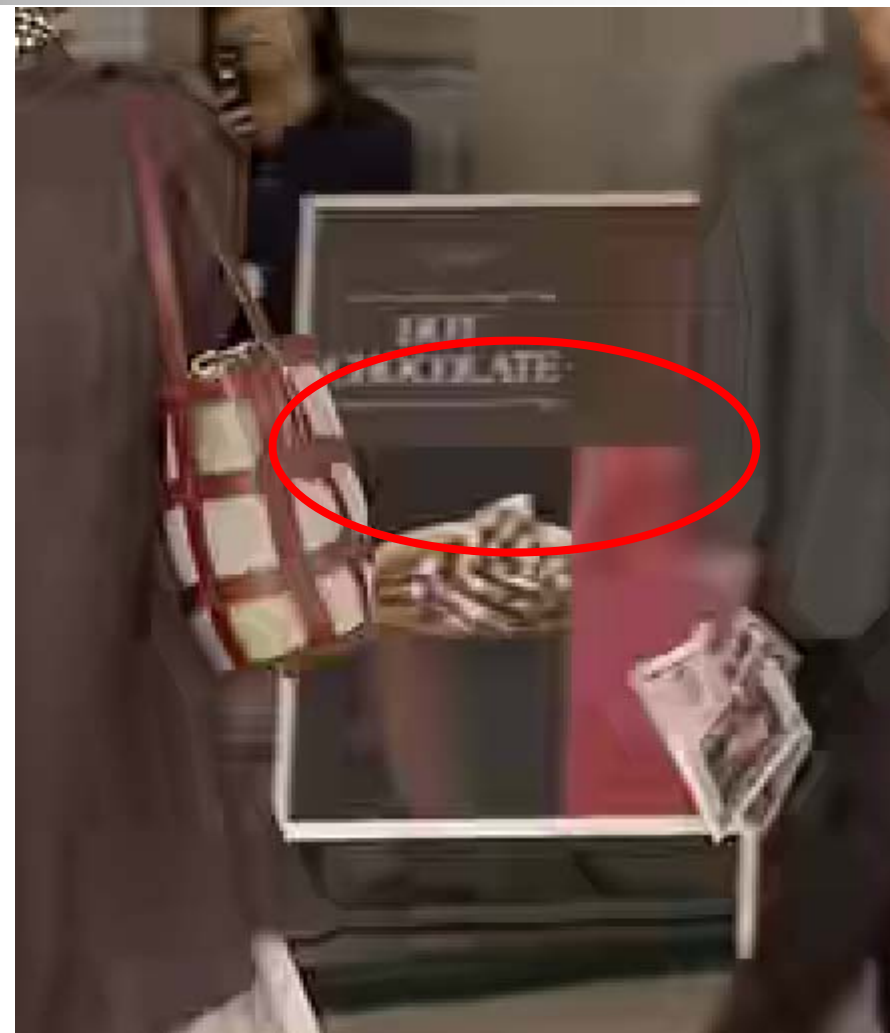
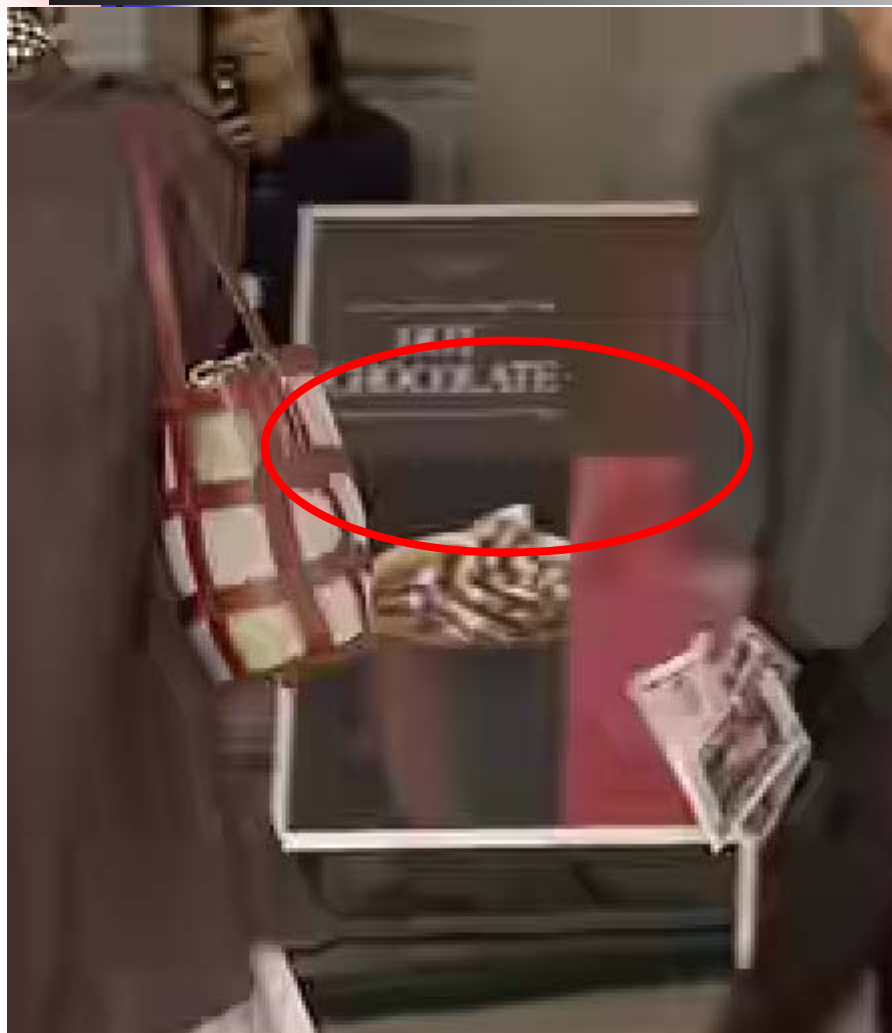


144th frame of LC(IO)_BQMall_832x480_QP37

Anchor

Proposed

Visual Quality Comparison (2)



253rd frame of LC(IO)_BQMall_832x480_QP37

Anchor

Proposed

Visual Quality Comparison (3)



105th frame of HE(10)_BQMall_832x480_QP27

Anchor

Proposed

Visual Quality Comparison (4)



143th frame of HE(10)_BQMall_832x480_QP37 without ALF

Anchor

Proposed

Visual Quality Comparison (5)



31st frame of LC(IO)_PartyScene_832x480_QP37

Anchor

Proposed

Visual Quality Comparison (6)



33th frame of LC(IO)_PartyScene_832x480_QP37

Anchor

Proposed

Visual Quality Comparison (7)



70th frame of HE(10)_PartyScene_832x480_QP32

Anchor

Proposed

Visual Quality Comparison (8)



7th frame of HE(IO)_PartyScene_832x480_QP37 without ALF

Anchor

Proposed

Conclusion Remarks

- In this proposal, we have presented *a computationally very simple deblocking filter designed with special attention to intra blocks.*
- The presented method employs exactly the same filtering scheme as that in the TMuC except control of filtering strength for intra blocks.
- *Even some small change of assigning different filtering strength for intra-coded blocks have generated positive coding gain and improved visual quality. (efficiently preserving vertical and horizontal edge)*
- Recommended that *the group import this technology in HM*